Fig. 1

Fig. 2

90

Electronic device

Control unit 91

92
I/O unit

93
UI unit

94
Data processing unit

95
Recording unit

Fig. 3

Analog broadcasting Digital broadcasting

Audio
Video
Still picture

STB

Video signal

Digital signal

TV

Digital signal

Video signal

DVD-recorder

DVD camcorder

Remote controller

PC

Video signal

DVD

Remote controller

Fig. 4

Encoder 105 ← ○ Video signal

Decoder 106 → ○ Video signal

○ Digital signal

104

Track buffer 103

ECC processing unit 102

101 Optical pickup

100

1 sector = 2KB

1 ECC block = 16 sectors

Fig. 5

(a)

Seek

Volume

| 0 | a1 | Continuous area A1 | a2 | | a3 | Continuous area A2 | a4 |

(b)

Amount of data accumulated in track buffer
B

B(t2)

Va-Vb

-Vb

t1   t2   t3   t

Readout of continuous area A1   Seek

Fig. 6

Accumulation control unit

Semiconductor memory

Hard disk drive

105 Encoder ← Video signal

106 Decoder → Video signal

→ Digital signal

104

DVD-RAM drive

103 Track buffer

102 ECC processing unit

101 Optical pictup

100

1 sector = 2KB

1 ECC block = 16 sectors

Read-in area

Read-out area

100

Data area

Zone 0
Zone 1
Zone 23

Fig. 7A

Read-in area

Read-out area

Data area

DMA

Zone 0 | Zone 1 | Zone 23

User area 0 | User area 1 | User area 23

Alternative area 0 | Alternative area 1 | Alternative area 23

Unused area | Unused area

DMA

Fig. 7B

Fig. 8A

User area 0	User area 1	...	User area 23

0 ————————— LSN ————————→ LastLSN

←——————— Volume space ———————→

Fig. 8B

Volume structure information

	File structure and files	

0 ————————————— LSN —————————————→

←—————————————— Volume space ——————————————→

Volume structure information

Inner ←——————————— Partition space ———————————→ Outer

0 ————————————— LBN —————————————→ LastLBN

Fig. 9

ROOT
├─ VIDEO_RT
│   └─ VIDEO Manager
│   ├─ PS_VOB
│   ├─ TS1_VOB
│   ├─ TS2_VOB
│   ├─ AOB
│   ├─ POB
│   └─ MNF

135 Read-out

133 Data area

100

Volume

131 Read-in

Fig. 10

Audio stream

Video stream

Video Object (MPEG System Stream)

VOBU VOBU VOBU VOBU

Fig. 11

Transport stream

TS packet

TS packet header

Program stream

Pack

Pack header

Packet

Packet header

PES packet

V#1 V#2 A#1 V#3 A#2

I-picture B-picture B-picture P-picture B-picture

Video stream

Audio frame Audio frame Audio frame Audio frame Audio frame Audio frame Audio frame Audio frame

Audio stream

Fig. 12

MPEG-TS stream

TS packet header

Adaptation field

TS packet

PID | PCR | Payload

Payload

Payload

PES header

PES packet

PES packet

PTS DTS | Video/Audio

Video/Audio

Fig. 13

MPEG-PS stream

Pack header

Pack

SCR
StreamID

PES papcket

PES papcket

PES header

Video/Audio

Video/Audio

PTS
DTS

Fig. 14

TS packet

Payload	Payload	Payload	Payload	Payload

Header	Adaptation field	Payload

---	Random access display	---	PCR	---	Stuffing byte

Indicating first frame of
audio/video and entry point

---	Unit start display	---	PID	---	Adaptation field control	---

Indicating type and attribute of stream

Indicating start of new PES packet

Fig. 15

MPEG-PS stream

Pack

Pack header

SCR
StreamID

PES packet

PES packet

PES header

Video/Audio

Video/Audio

PTS
DTS

Fig. 16A

Fig. 16B

PAT table

Program 1	PMAP table #1
Program 2	PMAP table #2
—	—
Program n	PMAP table #n

Fig. 16C

PMAP table #1

Video	PID=vv001
Audio	PID=aa002

Fig. 16D

PMAP table #2

Video	PID=vv002
Audio	PID=aa001

Fig. 17

(a)

100

1 sector =2KB

1 ECC block = 16 sectors

(b)

PS-VOB

2000

2001 | PS Pack (2KB) | PS Pack (2KB) | PS Pack (2KB) | ⋯ | PS Pack (2KB) |

(c)

TS1-VOB/TS2-VOB

1000

1001 | Capsule (8KB) | Capsule (8KB) | Capsule (8KB) | ⋯ | Capsule (8KB) | Capsule (8KB) |

| Capsule header (18B) | ATS (6B) | TS Packet (188B) | ATS (2B) | TS Packet (188B) | ⋯ | ATS (2B) | TS Packet (188B) |

1002   1003 1004

43 TS packets/Capsule

Fig. 18A

Video management information
(Video Manager)

General information		
Object information	PS-VOB information table	
	TS1-VOB information table	
	TS2-VOB information table	
Reproduction control information	User-defined program chain information table	
	Original program chain information table	
	Title search pointer	

PS-VOB information table:
- PS-VOB#1 information
- PS-VOB#2 information
- PS-VOB#n information

PS-VOB#1 information:
- General information
- Attribute information
- Map management information
- Access map

TS1-VOB information table:
- TS1-VOB#1 information
- TS1-VOB#2 information
- TS1-VOB#n information

TS1-VOB#1 information:
- General information
- Attribute information
- Map management information
- Access map

TS2-VOB information table:
- TS2-VOB#1 information
- TS2-VOB#2 information
- TS2-VOB#n information

TS2-VOB#1 information:
- General information
- Attribute information
- Map management information
- Access map

Fig. 18B

Map management information:
- Map validity information
- Self-encoding flag

Map validity information:
- Access point information flag
- Time access information flag

Fig. 19A

Video management information(Video Manager)

| General information |
| PS-VOB information table |
| TS1-VOB information table |
| TS2-VOB information table |
| **Original program chain information table** |
| **User-defined program chain information table** |
| Title search pointer |

| O-PGC#1 information |
| O-PGC#2 information |
| — |
| O-PGC#n information |

| U-PGC#1 information |
| U-PGC#2 information |
| — |
| U-PGC#n information |

| General information |
| O-CELL#1 information |
| O-CELL#2 information |
| — |
| O-CELL#n information |

Reproduction order →

| General information |
| U-CELL#1 information |
| U-CELL#2 information |
| — |
| U-CELL#n information |

Reproduction order →

Fig. 19B

Program chain information(PGC)
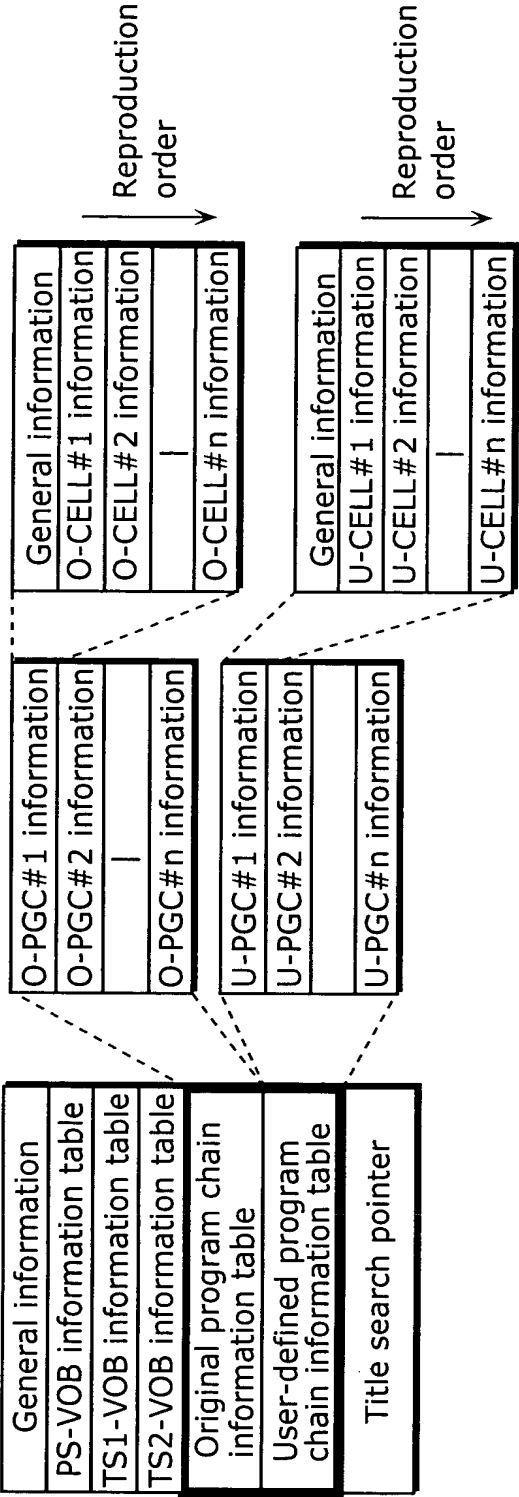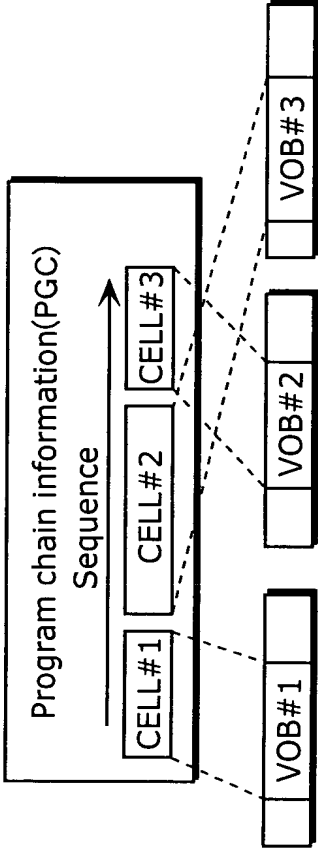
Sequence →

| CELL#1 | CELL#2 | CELL#3 |

| VOB#1 | VOB#2 | VOB#3 |

Fig. 20

Video management information(Video Manager)

User-defined PGC
information

| U-CELL
information
#1 | U-CELL
information
#2 |

70

Original PGC information

| O-CELL
information
#1 | O-CELL
information
#2 | O-CELL
information
#3 | O-CELL
information
#4 |

61   62   63

60a	Type
60b	Object ID
60c	Start PTM
60d	End PTM
60e	EntryPoint
information

50

60

Object information(ObjectI)

| General information | 80a |
| Attribute information | 80b |
| Access map
Time domain
Address area | 80c |

80

Cell

VOB

Sector

Fig. 21

Digital interface

Video decoder 205
Audio decoder

Video buffer
Audio buffer

Demultiplexer 204

Video decoder 206
Audio decoder
System decoder

Video buffer
Audio buffer
System buffer

Multiplexer buffer

Transport buffer
Transport buffer
Transport buffer

Demulti-plexer

Audio decoder 207
Still picture decoder 208

210

Track buffer 203

ECC processing unit 202

201

100

Control unit 211

Fig. 22

Fig. 23

DVD-recorder

TV

Semiconductor memory card

Optical disc

Digital signal

PC

Video signal

Digital signal

DSC

Remote controller

Fig. 24A

```
ROOT ─── DCIM ─── 100ABCDE ─┬─ ABCD0001.JPG
                            ├─ ABCD0002.JPG
                            ├─ ABCD0003.JPG
                            │  ABCD0003.THM
                            │  ABCD0003.WAV
                            ├─ ABCD0004.JPG
                            ├─ ABCD0005.TIF
                            │  ABCD0005.THM
                            └─ ABCD0006.JPG
                  └─ 101ABCDE
```

DCF directory   DCF object

Fig. 24B

Still picture related files

Extension	Details of file
JPG	DCF basic file
THM	DCF thumbnail file
WAV	Audio file
TIF	Other still picture file (Example of DCF extended image file)

Fig. 25

DCF basic file

SOI
APP1
Other Data

Fig. 26

Fig. 27

Recording
medium — 1100

Data recording/
reproduction unit — 1221

System control
unit — 1212

User I/F
unit — 1222

Decoder — 1218

Display unit — 1217

Digital I/F
unit — 1219

Still picture encoder — 1224

Camera unit — 1223

Fig. 28

Client terminal _A

Client terminal _B

Client terminal _C

User

Server 10

Optical disc

Network connection

Fig. 29

'03-10/10 13:00

Athletic meet

'03-10/10 13:00

'03-10/10 13:00

1st

ON/OFF

10

A

B

C

Fig. 30

Fig. 31

Fig. 32

(a)

Client terminal A ⟷ Network connection established ⟷ Server 10

(b)

Client terminal A ⟶ Server 10

Send ⬆

Terminal characteristic information (Client terminal A) I100

(c)

Client terminal A

Client terminal B

Send ⬆

Terminal characteristic information (Client terminal B) I100

⟶ Server 10

Terminal characteristic information (Client terminal A)

Fig. 33

<u>1100</u>

Terminal ID information
Recording attribute information
Reproduction attribute information
Access control information
Terminal specific information

Fig. 34A

I100

| Terminal ID information |
| Recording attribute information |
| Reproduction attribute information |
| Access control information |
| Terminal specific information |

| General attribute information |
| Application attribute information table |

| Application attribute information #1 |
| Application attribute information #2 |
| . . . |
| Application attribute information #n |

Fig. 34B

| General application information |
| Data attribute information table |
| Extended information |

| Application attribute information |

| Data attribute information #1 |
| Data attribute information #2 |
| . . . |
| Data attribute information #n |

Fig. 35A

| Data attribute information | General data attribute information |
| | Individual data attribute information table |

| Individual data attribute information #1 |
| Individual data attribute information #2 |
| ... |
| Individual data attribute information #n |

Fig. 35B

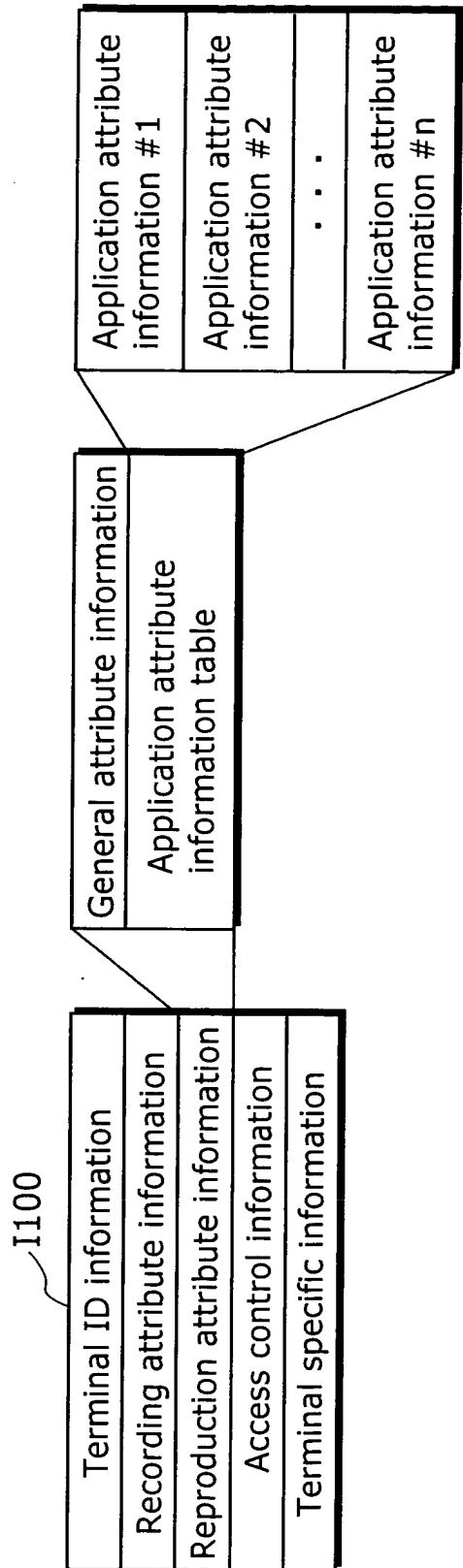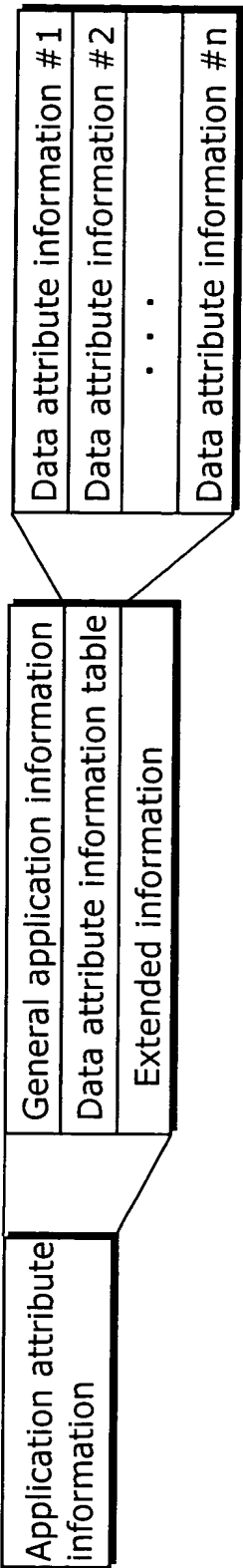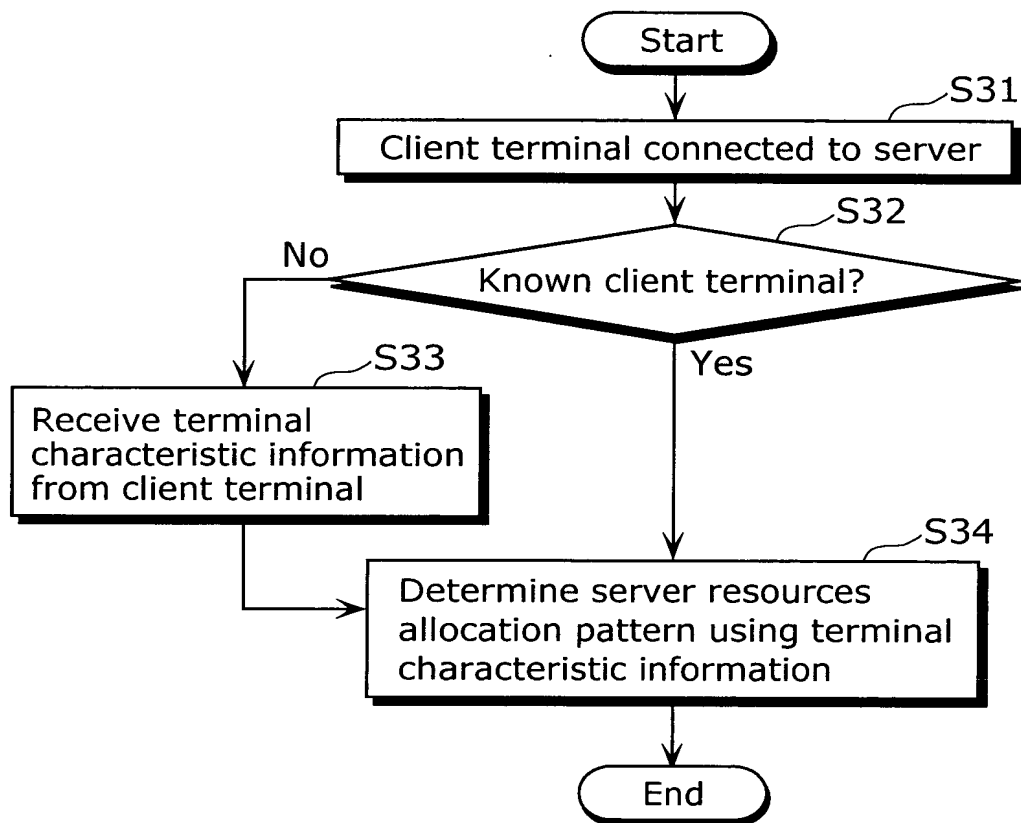| Attributes	Settable attribute values
Required band information	6 (Mbps) (Specified value)
Continuous media attribute	1: Continuous media data 0: Discrete media data
Non-retransmittable data attribute	1: Non-retransmittable data 0: Retransmittable data
Copy attribute	1: Copy data 0: Not copy data

Fig. 36A

I100

| Terminal ID information |
| Recording attribute information |
| Reproduction attribute information |
| Access control information |
| Terminal specific information |

| General attribute information |
| Application attribute information table |

| Application attribute information #1 |
| Application attribute information #2 |
| · · · |
| Application attribute information #n |

Fig. 36B

| Application attribute information |

| General application information |
| Data attribute information table |
| Extended information |

| Data attribute information #1 |
| Data attribute information #2 |
| · · · |
| Data attribute information #n |

Fig. 37

```
                    ┌─────────────┐
                    │    Start    │
                    └──────┬──────┘
                           │          ⌒S31
            ┌──────────────▼────────────────────┐
            │  Client terminal connected to server│
            └──────────────┬────────────────────┘
                           │          ⌒S32
          No         ◇─────▼─────◇
    ◄────────────────  Known client terminal?
                       ◇───────────◇
              ⌒S33            │ Yes
    ┌──────────────────┐      │
    │ Receive terminal  │      │          ⌒S34
    │ characteristic    │      ▼
    │ information       │  ┌──────────────────────┐
    │ from client terminal│  │ Determine server resources│
    └────────┬─────────┘  │ allocation pattern using terminal│
             │            │ characteristic information│
             └───────────►└──────────┬───────────┘
                                     │
                              ┌──────▼──────┐
                              │     End     │
                              └─────────────┘
```

Fig. 38

(a)

(Spare)	Application A (DCF)	Application B (DVD)

(b)

Application A (DCF)	Application B (DVD)

Fig. 39

Fig. 40

Partition space

| Sub-area #1 | Sub-area #2 | Sub-area #3 | · · · | Sub-area #n | Sub-area #n+1 | · · · |

Application A

Virtual partition space

Recording direction

Loop recording start position

Application B

Virtual partition space

Recording direction

Loop recording start position

Fig. 41A

Client terminal list	Server resources to be allocated to each client terminal		
	Pattern 1	Pattern 2	Pattern 3
Client A	Recording transfer band: 80Mbps	Recording transfer band: 20Mbps	(No pattern)
Client B	(No allocation)	Recording transfer band: 70Mbps	
Client C	Recording transfer band: 20Mbps	Recording transfer band: 10Mbps	

Fig. 41B

Client terminal list	Server resources to be allocated to each client terminal		
	Pattern 1	Pattern 2	Pattern 3
Client A	Recording transfer band: 80Mbps	Recording transfer band: 20Mbps	(No allocation)
Client B	(No allocation)	Recording transfer band: 70Mbps	Recording transfer band: 90Mbps
Client C	Recording transfer band: 10Mbps	Recording transfer band: 10Mbps	Recording transfer band: 10Mbps <User-made pattern>

Fig. 42

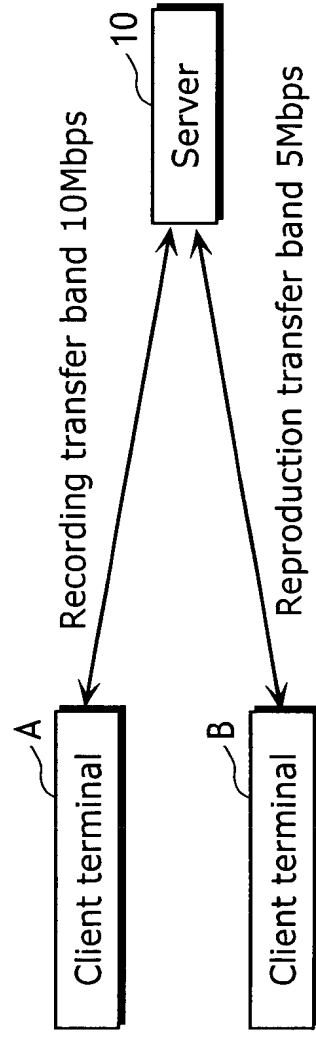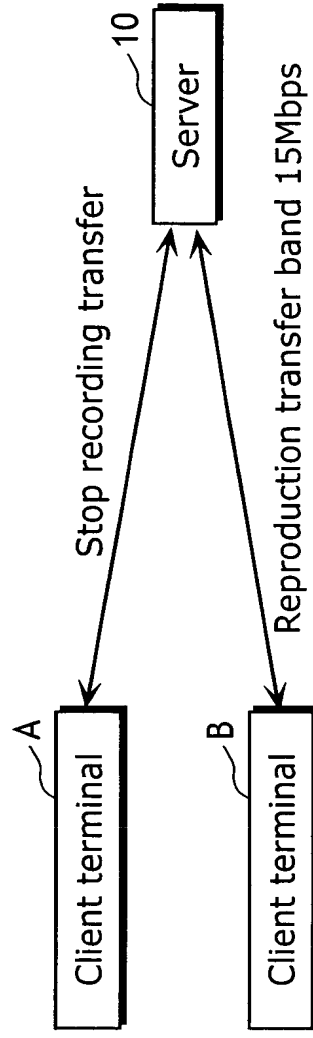| Client terminal list | Server resources to be allocated to each client terminal | | |
	Pattern 1	Pattern 2	Pattern 3
Client A	Recording transfer band : 100Mbp	Recording transfer band : 80Mbp	Recording transfer band : 20Mbp
Client B	Recording transfer band : 90Mbp	Recording transfer band : 70Mbp	(No pattern)
Client B / Client C	Recording transfer band: 90Mbp / Recording transfer band: 10Mbp	Recording transfer band: 70Mbp / Recording transfer band: 10Mbp	(No pattern)
Client A / Client B / Client C	Recording transfer band: 80Mbp / (No allocation) / Recording transfer band: 10Mbp	Recording transfer band: 20Mbp / Recording transfer band: 70Mbp / Recording transfer band: 10Mbp	(No allocation) / Recording transfer band: 90Mbp / Recording transfer band: 10Mbp <User-made pattern>

Fig. 43A

Client terminal A ←→ Recording transfer band 10Mbps ←→ Server 10

Client terminal B ←→ Reproduction transfer band 5Mbps ←→ Server

Fig. 43B

Client terminal A ←→ Stop recording transfer ←→ Server 10

Client terminal B ←→ Reproduction transfer band 15Mbps ←→ Server

Fig. 44

I101

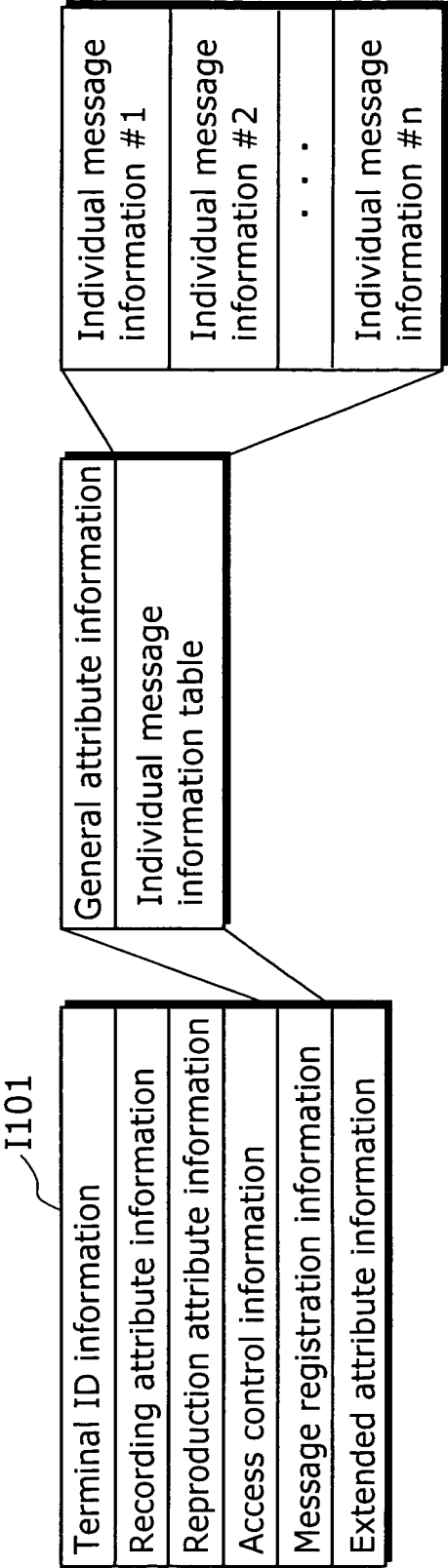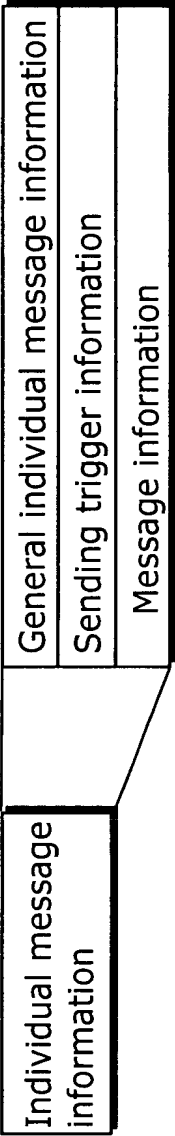| |
|---|
| Terminal ID information |
| Recording attribute information |
| Reproduction attribute information |
| Access control information |
| Message registration information |
| Extended attribute information |

Fig. 45A

I1101

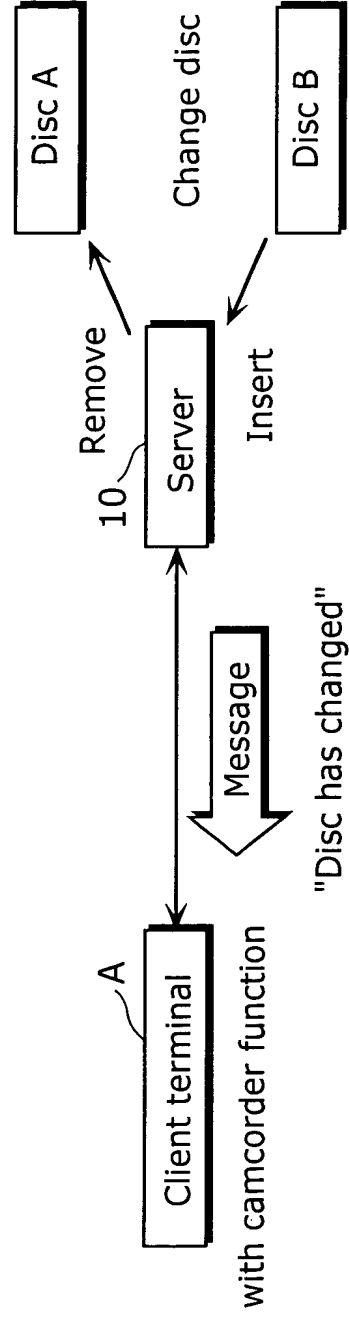| Terminal ID information |
| Recording attribute information |
| Reproduction attribute information |
| Access control information |
| Message registration information |
| Extended attribute information |

| General attribute information |
| Individual message information table |

| Individual message information #1 |
| Individual message information #2 |
| . . . |
| Individual message information #n |

Fig. 45B

| Individual message information |

| General individual message information |
| Sending trigger information |
| Message information |

Fig. 46

Disc A

Change disc

Disc B

Remove

10 — Server

Insert

Message

"Disc has changed"

A

Client terminal

with camcorder function

Fig. 47

(a)

Client terminal
A
with camcorder function

Server
10
Short distance→OK

Near ⇐   ⇒ Far

(b)

Client terminal
A

Message

"Network connection is unstable"

Server
10
Long distance→Send message

Fig. 48

Fig. 49

Management data

ROOT
VIDEO_RT
VIDEO Manager
PS_VOB
TS1_VOB
TS2_VOB
AOB
POB

DCIM

40
Server

A
Client terminal
with DVD camcorder function

B
Client terminal
with DSC function

Fig. 50

Management data

ROOT

VIDEO_RT ── VIDEO Manager
         ├── PS_VOB
         ├── TS1_VOB
         ├── TS2_VOB
         ├── AOB
         └── POB

DCIM

40

Server

Client terminal A
with DVD camcorder function

Client terminal B
with DSC function

Client terminal C
with DVD camcorder function

Fig. 51

Fig. 52

Management data

ROOT

VIDEO_RT
— VIDEO Manager
— PS_VOB
— TS1_VOB
— TS2_VOB
— AOB
— POB

DCIM

SCRIPT
— ABCD0001.XML

Server
40

Client terminal A
with DVD camcorder function

Client terminal B
with DSC function

Fig. 53

Display
(UI unit 13 or 23)

Application A
(DVD/MPEG2)

Application B
(DCF/JPEG)

Fig. 54

```
<smil>
<head>
<layout>
<!--layout tags-->
  <region regionname="A" top="..."left="..."bottom="..."right="..."/>
  <region regionname="B" top="..."right="..."width="..."height="..."/>
</layout>
</head>
<body>
<!--body tags-->
<seq>
<img video="1000ABCD.MPG" region="A"/>          1
<par>                                           2
  <img video="2000ABCD.MPG" region="A"/>
  <img src="2001ABCD.JPG" region="B" dur="T2"/> 3
</par>
<img video="3000ABCD.MPG" region="A"/>          4
</seq>
</body>
</smil>
```
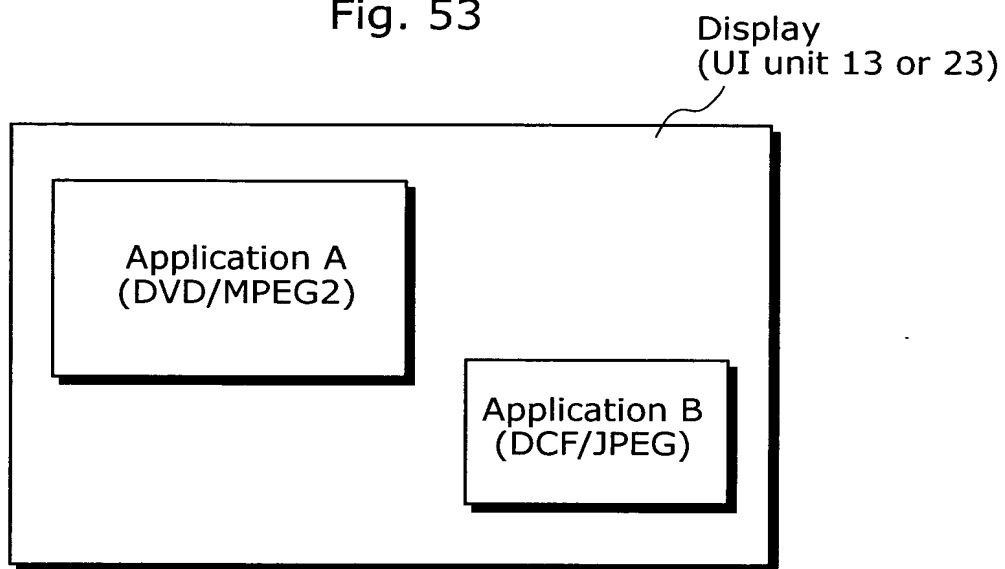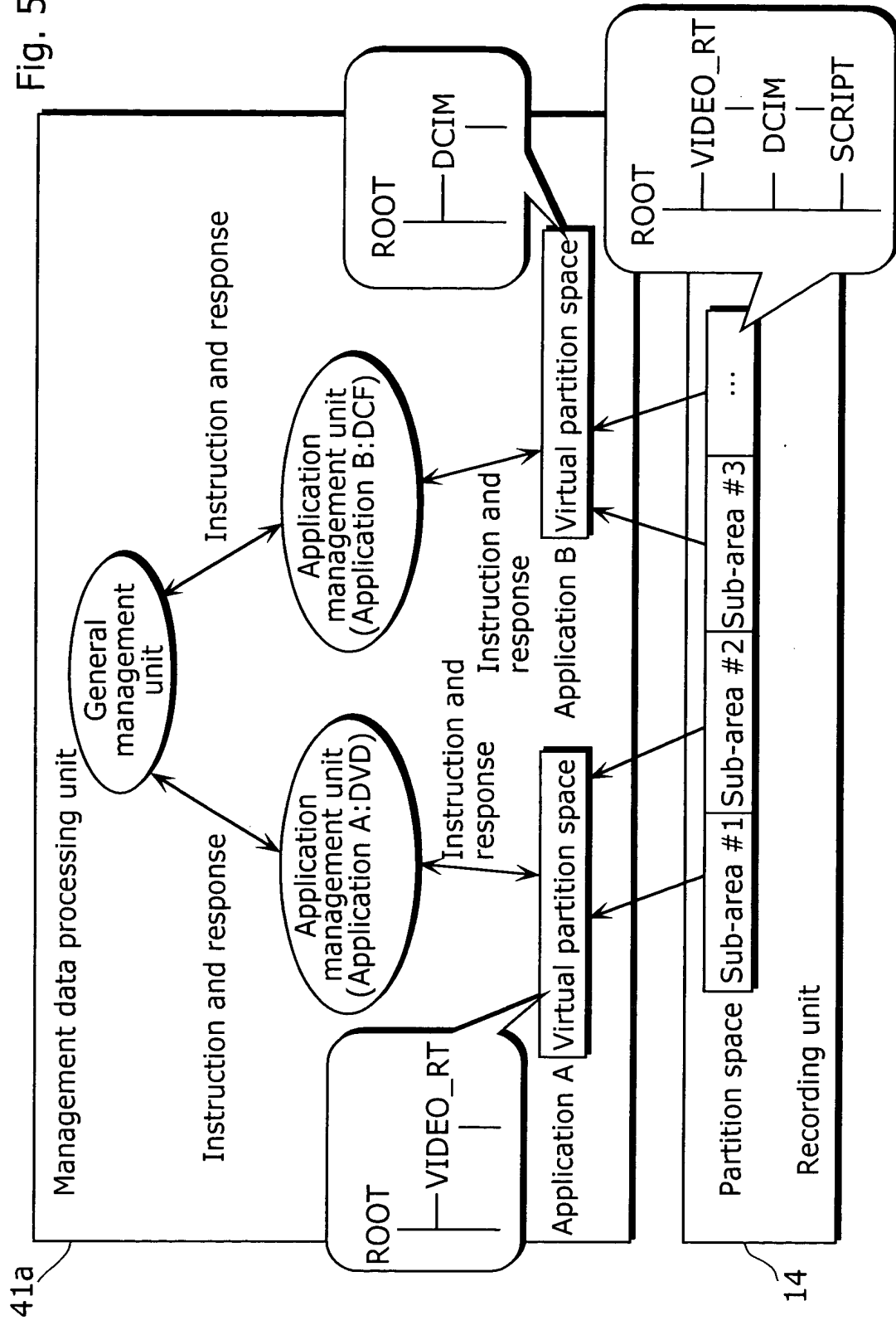
Fig. 55

Management data processing unit

General management unit

Application management unit (Application A:DVD)

Application management unit (Application B:DCF)

Instruction and response

Instruction and response

Instruction and response

Instruction and response

ROOT
— VIDEO_RT

ROOT
— DCIM

ROOT
— VIDEO_RT
— DCIM
— SCRIPT

Application A | Virtual partition space

Application B | Virtual partition space

Partition space | Sub-area #1 | Sub-area #2 | Sub-area #3 | ...

Recording unit

41a

14

Fig. 56

41a

Management data processing unit

Instruction and response

General management unit

Instruction and response

Application management unit (Application A: DVD)

Instruction and response

Application A

Virtual partition space

Instruction and response

Application management unit (Application B: DCF)

Instruction and response

Application B

Virtual partition space

Read-in and analysis

Script file

Display
(UI unit 13 or 23)

Application A
(DVD/MPEG2)

Application B
(DCF/JPEG)

Fig. 57

(a)

Display (UI unit 13)

region="A"   rA

region="B"   rB

(b)

t=0

1000ABCD.MPG   1

2000ABCD.MPG   2

3000ABCD.MPG   4

2001ABCD.DCF   3

T2

→ Time